

The National Oceanographic Data Center

By JOHN TATGE

AS MAN probes further into the reaches of outer space, the specialized field of scientific research known as oceanography is striving with increasing intensity to find the dark secrets that lie hidden in the vast depths of the sea.

Spurred by a burgeoning world population that demands cheap, abundant food resources; lured by the promise of vast mineral wealth; and intrigued by the esoteric search for the origins of the world, modern science is developing many new tools to assist the chemical, physical, and geological oceanographer in his studies. These instruments range from electronic data processing equipment, telemetering devices, and underwater motion picture cameras to the deep sea equivalent of a space craft.

As in all fields of science, current oceanographic research projects rely on the information and data gathered in earlier studies. It is collected and stored for this purpose at a central, factual reference point that affords a practical, automatic means of connecting data sources, processing units, and the scientists desiring information on past and current projects. Although the National Oceanographic Data Center in Washington, D.C., acting merely as a storehouse, supplies some of the tools for scientific investigation, its most important role is that of an information center providing the basic data—including chemical, physical, biological, geological, and all related information pertaining to the seas. Such information serves to further understanding of the interrelations and interactions of the physical, chemical, and biological properties of the sea to a degree never before possible.

The data center is supported by funds from the Bureau of Commercial Fish-

eries, the National Science Foundation, and the Coast and Geodetic Survey, each of which contribute 16 per cent of the budget; the Department of the Navy provides 48 per cent of funds; and the Atomic Energy Commission and the United States Weather Bureau account for 2 per cent each. By 1964 it is expected that the Coast Guard, the Geological Survey, and the Department of Health, Education and Welfare will also share in the activities and support of the center—a fact that is indicative of the rapidly expanding scope of its activities.

The Bureau of Commercial Fisheries' interest in the National Oceanographic Data Center lies in the Bureau's need to know more about the oceans as a source of food. Data collected on estuaries, coastal areas, and the open seas afford a better understanding of all the natural phenomena which affects the success of fishing.

For instance, the bureau's tuna investigations, currently conducted in the Hawaiian Islands, contribute significantly to oceanographic studies by showing the relation of newly upwelled, nutrient-rich water to productivity, plankton, and tuna abundance along the equator in the mid-Pacific Ocean. Around the Hawaiian Islands, salinity and temperature conditions help predict spring and summer skipjack tuna catches.

But far more important has been the recent discovery in the Pacific equatorial region of a major ocean current that ranks in magnitude with the Kuroshio and Gulf Stream. Locating the Cromwell Current, as it is called, has already brought about a vast increase in understanding the circulation of the Pacific Ocean and has led to a better knowl-

edge of the movements and distribution of major fishery resources.

The National Academy of Science's interest in oceanography dates back to 1929, when a report stimulated the establishment of Woods Hole Oceanographic Institute, the Department of Oceanography at the University of Washington, and other laboratories. The NAS also proposed the establishment of NODC in another report in the belief that such a data center supported by government agencies concerned with the sciences can provide an important service to the scientific community as well as the agencies.

Because present knowledge of the various factors controlling the distribution of radioactivity in the ocean is at best only fragmentary, the Atomic Energy Commission is concerned with various oceanographic projects. These include engineering studies in and near disposal areas, monitoring of disposal sites and their surroundings, and continuing research in the broad areas of oceanography.

In assessing such factors as circulation and mixing rates, uptake, and utilization of radioactive isotopes by biological organisms and sedimentation, the AEC is gathering information that eventually will reveal the ultimate fate of long-lived radioactive isotopes in the oceans.

But Bureau of Commercial Fisheries research vessels that patrol the seas twelve months out of the year have been accumulating physical, chemical, and biological data much faster than traditional processing and analyzing methods can handle. The research on board ship is supplemented by automatic stationary monitoring devices which are rapidly filling in the statistical gaps created by changes in readings as research vessels follow their courses. These two sources yield a vast quantity of data that can be handled only by a specially equipped facility, such as the National Oceanographic Data Center.

In processing physical and chemical data, NODC has been accumulating information from sources such as these at the rate of ten thousand readings per month. To date, the archives of NODC contain over one million readings from bathythermograph observations taken by monitoring stations and research vessels.

A bathythermograph is the oceanographer's key tool. A cylindrical shaped object, dropped over the side of the ship, the bathythermograph makes simultaneous depth and temperature readings for physicists and chemists. As the bottle plunges down to a predetermined depth, a stylus etches a curved configuration on the gold-plated $1 \times 1\frac{3}{4}$ -inch glass slide. The line is then transferred to a standard graph form, which reflects the temperature and depth readings.

A negative of the temperature depth graph is made and the resulting prints are placed in the center's filing and information retrieval systems. These duplicate prints of bathythermograph readings are filed according to Marsden squares of the map, a system which establishes a reference point for each degree of longitude and latitude in the ocean. To date, almost one million cards have been accumulated to provide temperature and depth data for several thousand Marsden squares.

A quality control department at the center compares the validity of new data with that already accumulated by means of a salinity control envelope, a form of graphic reproduction of ocean depth-temperature relationships. Any data that is inaccurate shows up visually on the envelope.

At the present time, the data center is processing only physical and chemical data; eventually, it will be equipped to provide all types of data pertaining to oceanography, including the systems devised for geological and geophysical data storage and retrieval. In accumulating geophysical data, the NODC will even-

tually provide indexes to quantitative and qualitative data pertaining to gravity, magnetism, seismicity, volcanoes, tsunamis, conductivity, layer thickness, acoustics, radioactivity, heat flow, and reflectivity.

Bathymetric data from bathythermographs will eventually include tracklines, PDR traces, fathograms, discrete sonic soundings, wire soundings, index of roughness, and slope. Bottom and sedi-

ment and rock data will include the physical properties, size analysis, mineralogy, geochemical properties, engineering aspects, paleontology, and bottom photographs.

The growing international interest in oceanography has led to greater participation of foreign countries, which are now supplying data to the center, as well as drawing on its wealth of rapidly accumulating information. ■■

U.S. Office of Education 1962-63 College and University Library Statistics

FOR THE PAST three years the Office of Education has collected basic data on the book collection, staff, expenditures and salaries of college and university libraries. This information was published as Institutional Data for 1959-60, 1960-61 and 1961-62 and an Analytic Report for 1959-60. The analytic reports for 1960-61 and 1961-62 will be released in one volume which is nearing completion. Whereas Institutional Data provide information about individual institutions, arranged by states, the Analytic Report contains summaries by type of academic institution and size of enrollment.

For the first time, last year, over a dozen state libraries cooperated with the Library Services Branch in the distribution and collection of questionnaires. Thanks to this collaboration, the returns in these states were substantially higher than in the nonparticipating states. As a result, this year all fifty states were invited to participate in this cooperative effort and forty-eight state library agencies are assisting the Office of Education in this study. In Alabama and North Dakota, the academic libraries are being contacted directly. The 1962-63 forms were mailed out between August 19 and 21.

In response to requests for earlier releases of statistical data from the Association of College and Research Libraries and individual librarians, it was decided to ask academic libraries to return their forms as early as possible but not later than September 30, 1963 to the state agencies or, in the case of Alabama and North Dakota institutions, to the U.S. Office of Education.

In January 1964 the office will publish the institutional data for all libraries which have met the September 30 deadline. The second deadline for inclusion in the Analytic Report is set for December 1, 1963, to assure publication by the summer of 1964.

Based on past experience it is hoped that at least 60 per cent of academic libraries will be included in the current listing of institutional data. To speed up the release of the Analytic Report the Library Services Branch cannot make available a more complete listing of 1962-63 institutional data.

Questions were added this year on interlibrary loan transactions and the hourly wage rate paid to student assistants. The information concerning salaries of full time personnel is requested in a simpler and more specific manner than previously.

It is expected that the procedures for the current survey will result in faster and better service to administrators, librarians and others concerned with academic library service. Better coordination and less duplication in the collection and analysis of academic library statistics should also result.

If this year's effort succeeds, it could be said that a nationwide academic library statistics system has been established.—*Frank L. Schick, Assistant Director, Library Services Branch.*